

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
16 October 2003 (16.10.2003)

PCT

(10) International Publication Number  
WO 03/084880 A1(51) International Patent Classification<sup>7</sup>: C02F 1/40,  
11/00, C25B 9/00, 13/00, G01N 27/27, 27/403, 27/453(utility model), EE, ES, FI (utility model), FI, GB, GD, GE,  
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,  
LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,  
MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,  
SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(21) International Application Number: PCT/US02/10444

(22) International Filing Date: 2 April 2002 (02.04.2002)

(25) Filing Language:

English

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,  
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent  
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,  
NE, SN, TD, TG).

(26) Publication Language:

English

(71) Applicant and

(72) Inventor: GAJEK, Ryszard [US/US]; 2025 Center Avenue, Martinez, CA 94553 (US).

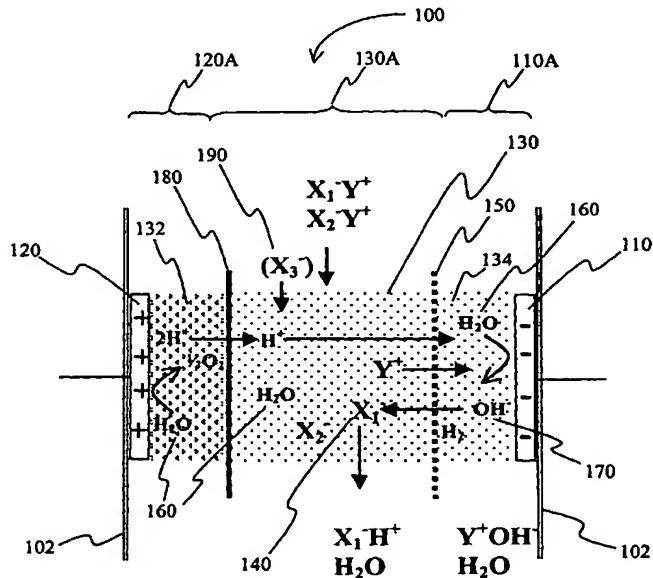
(74) Agents: RUTAN &amp; TUCKER LLP et al.; 611 Anton Blvd., Suite 1400, Costa Mesa, CA 92626 (US).

**Published:**

— with international search report  
— with amended claims

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SEPARATION SYSTEMS WITH CHARGE MOSAIC MEMBRANE



WO 03/084880 A1

(57) Abstract: An ion is eluted from an ion exchange resin (132) in a separation system (100) using an eluent generated by electrolysis of a medium. Elution is further assisted by an electrical field between two electrodes (120, 110), wherein the ion exchange resin (132) is at least partially disposed between the electrodes. Particularly preferred aspects of such separation systems include gradient separation and buffered electrodialysis.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/10444

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C02F 1/40, 11/00; C25B 9/00, 13/00; G01N 27/27, 27/403, 27/453  
 US CL : 204/600, 520, 536, 540, 541, 543, 544, 630, 632, 637

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : 204/600, 520, 536, 540, 541, 543, 544, 630, 632, 637

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5633171 A (SMALL et al.) 27 May 1997 (27.05.1997), column 4, line 37 - column 14, line 18.	1-20
X	US 6,036,921 A (SMALL et al) 14 March 2000 (14.03.2000), column 2, line 65 - column 20, line 21.	1-20
X	US 6,027,643 A (SMALL et al) 22 February 2000 (22.02.2000), column 2, line 59 - column 22, line 51	1-20
X	US 6,017,433 A (MANI) 25 January 2000 (25.01.2000), column 6, line 64 - column 24, line 11.	1-20
X	US 6,093,327 A (ANDERSON Jr et al) 25 July 2000 (25.07.2000), column 6, line 51 - column 42, line 18.	1-20
X	US 6,251,259 B1 (SATOH et al) 26 June 2001 (26.06.2001), column 1, line 64 - column 18, line 10.	1-20
X	US 6,296,751 B1 (MIR) 02 October 2001 (02.10.2001), column 3, line 60 - column 14, line 26.	1-20
X	US 5,407,553 A (HERRON et al) 18 April 1995 (18.04.1995), column 3, line 16 - column 12, line 12.	1-20

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*B\* earlier application or patent published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

09 July 2002 (09.07.2002)

Date of mailing of the international search report

20 AUG 2002

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks  
 Box PCT  
 Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

*Jill A. Warden*

Telephone No. (703) 308-0661

Form PCT/ISA/210 (second sheet) (July 1998)

BEST AVAILABLE COPY

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/10444

**Continuation of B. FIELDS SEARCHED Item 3:**

EAST search terms: EOF, electroosmotic flow, dialysis, water purification, salt conversion, ion reflux, electroelution, gradient elution, ion chromatography, membrane, barrier, electrode